Potential bioterrorism agent: Category B

Q FEVER

DISEASE REPORTING

In Washington

DOH receives 0 to 2 reports of Q fever per year. The last death associated with Q fever occurred in 1987.

Purpose of reporting and surveillance

- To identify sources transmission (e.g., an outbreak at a rendering plant) and to prevent further transmission from such sources.
- To educate potentially exposed persons about signs and symptoms of disease, thereby facilitating early diagnosis.
- To raise the index of suspicion of a possible bioterrorism event if no natural exposure source is identified.

Reporting requirements

- Health care providers: notifiable to Local Health Jurisdiction within 3 work days
- Hospitals: notifiable to Local Health Jurisdiction within 3 work days
- Laboratories: no requirements for reporting
- Local health jurisdictions: notifiable to DOH Communicable Disease Epidemiology within 7 days of case investigation completion or summary information required within 21 days. ***If bioterrorism is suspected, case must be immediately reported to DOH: 1-877-539-4344***

CASE DEFINITION FOR SURVEILLANCE

Clinical criteria for diagnosis

Acute infection: A febrile illness usually accompanied by rigors, myalgia, malaise, and retrobulbar headache. Severe disease can include acute hepatitis, pneumonia, and meningoencephalitis. Clinical laboratory findings may include elevated liver enzyme levels and abnormal chest film findings. Asymptomatic infections may also occur.

Chronic infection: Potentially fatal endocarditis may evolve months to years after acute infection, particularly in persons with underlying valvular disease. A chronic fatigue-like syndrome has been reported in some Q fever patients.

Laboratory criteria for diagnosis

- Fourfold or greater change in antibody titer to *C. burnetii* phase II or phase I antigen in paired serum specimens ideally taken 3-6 weeks apart, or
- Isolation of *C. burnetii* from a clinical specimen by culture, or
- Demonstration of *C. burnetti* in a clinical specimen by detection of antigen or nucleic acid.

Case definition

- Probable: a clinically compatible or epidemiologically linked case with a single supportive Immunoglobulin G (IgG) or Immunoglobulin M (IgM) titer. Cutoff titers are determined by individual laboratories. CDC tests for IgG antibodies with an indirect immunofluorescence assay (IFA), and uses a titer of 1:128 as the cutoff for significant antibody.
- Confirmed: a case that is laboratory confirmed, or a case that meets the clinical case definition and is not laboratory confirmed, but is epidemiologically linked to a confirmed case.

A. DESCRIPTION

1. Identification

An acute febrile rickettsial disease; onset may be sudden with chills, retrobulbar headache, weakness, malaise and severe sweats. There is considerable variation in severity and duration; infections may be inapparent or present as a nonspecific fever of unknown origin. A pneumonitis is found on x-ray in some cases, but cough, expectoration, chest pain and physical findings in the lungs are not prominent. Abnormal liver function tests are common. Acute and chronic granulomatous hepatitis, which can be confused with tuberculous hepatitis, has been reported. Chronic Q fever manifests primarily as endocarditis and this form of the disease can occur on abnormal native (e.g., bicuspid aortic) or prosthetic cardiac valves; these infections have an indolent course, extending over years. Other rare clinical syndromes, including neurologic, have been described. The case-fatality rate in untreated acute cases is usually less than 1% but has been reported as high as 2.4%; it is negligible in treated cases, except in individuals who develop endocarditis, in whom protracted antibiotic courses are the rule and valve replacement operations are often required.

Laboratory diagnosis is made by demonstration of a rise in specific antibodies between acute and convalescent stages by IF, microagglutination, CF or ELISA tests; high antibody titers to phase I of the infective organism may indicate chronic infection, such as endocarditis. Recovery of the infectious agent from blood is diagnostic but poses a hazard to laboratory workers. Q fever Coxiellae may be identified in tissues (liver biopsy or heart valve) by immunostains and EM.

2. Infectious Agent

Coxiella burnetii, an organism with two antigenic phases: phase I is found in nature and phase II after multiple laboratory passages in eggs or cell cultures. The organism has unusual stability, can reach high concentrations in animal tissues, particularly placentae, and is highly resistant to many disinfectants.

3. Worldwide Occurrence

Reported from all continents; the incidence is greater than that reported because of the mildness of many cases, limited clinical suspicion and nonavailability of testing laboratories. It is endemic in areas where reservoir animals are present, and affects veterinarians, meat workers, sheep (and occasionally dairy) workers and farmers. Epidemics have occurred among workers in stockyards, meat packing and rendering plants, laboratories and in medical and veterinary centers that use sheep (especially pregnant ewes) in research. Thousands of cases occurred in US troops in Europe during World War II. Individual cases may occur where no direct animal contact can be demonstrated. Evidence of previous infection is common among researchers working with *C. burnetii* and cases have occurred among casual visitors to such facilities.

4. Reservoir

Sheep, cattle, goats, cats, dogs, some wild animals (bandicoots and many species of feral rodents), birds and ticks are natural reservoirs. Transovarial and transstadial transmission are common in ticks that participate in wildlife cycles in rodents, larger animals and birds. Ticks were not considered a major source of human infection in the US. Infected animals, including sheep and cats, are usually asymptomatic, but shed massive numbers of organisms in placental tissues at parturition.

5. Mode of Transmission

Commonly by airborne dissemination of Coxiellae in dust from premises contaminated by placental tissues, birth fluids and excreta of infected animals; in establishments processing infected animals or their byproducts and in necropsy rooms. Airborne particles containing organisms may be carried downwind for a considerable distance (one-half mile or more); also by direct contact with infected animals and other contaminated materials, such as wool, straw, fertilizer and laundry. Raw milk from infected cows contains organisms and may be responsible for some cases, but this has not been proven. Direct transmission by blood or marrow transfusion has been reported.

6. Incubation period

Depends on the size of the infecting dose; usually 2-3 weeks.

7. Period of communicability

Direct transmission from person to person occurs rarely, if ever. However, contaminated clothing may be a source of infection.

8. Susceptibility and resistance

Susceptibility is general. Immunity following recovery from clinical illness is probably lifelong, with cell mediated immunity lasting longer than humoral. Antibodies detected by CF persist for 3-5 years: antibodies detected by IF may persist as long as 10-15 years.

B. METHODS OF CONTROL

1. Preventive measures:

a. Educate persons in high risk occupations (sheep and dairy farmers, veterinary researchers, abbatoir workers) on sources of infection and the necessity for adequate disinfection and disposal of animal products of conception; restrict access to cow and sheep sheds, barns and laboratories with potentially infected animals, and stress the value of inactivation procedures such as pasteurization of milk.
b. Pasteurizing milk from cows, goats and sheep at 62.7°C (145°F) for 30 minutes or at 71.6°C (161°F) for 15 seconds, or boiling, inactivates Q fever Coxiellae.
c. No commercially available vaccine currently exists in the US. Immunization with an investigational inactivated vaccine prepared from *C. burnetii* phase I-infected yolk sac is useful in protecting laboratory workers and is strongly recommended for those knowingly working with live *C. burnetii*. It should also be considered for abattoir workers and others in hazardous occupations, including those carrying out medical research with pregnant sheep. To avoid severe local reactions, vaccine administration should be preceded by a skin sensitivity test with a small dose of diluted vaccine; vaccine should not be given to individuals with a positive skin or antibody test or a documented history of Q fever. Vaccine may be obtained under IND by contacting the Commanding Officer, US Army Medical Research and Materiel Command, ATTN: MCMR-UMP, Fort Detrick, Frederick, MD 21702-5009; telephone 301-619-2051.
d. Research workers using pregnant sheep should be identified and enrolled in a medical surveillance and health education program. This program should include a baseline serum evaluation, followed by periodic evaluations. Persons at risk (i.e., those with valvular heart disease, women of child bearing age, persons who are immunosuppressed) should be advised of the risk of serious illness that may result from Q fever. Animals used in research should also be assessed for Q fever infection by serology. Laboratory clothes must be appropriately bagged and washed to prevent infection of laundry personnel. Sheepholding facilities should be away from populated areas and measures should be implemented to prevent air flow to other occupied areas; no casual visitors should be permitted.

2. Control of patient, contacts and the immediate environment:

a. Report to local health authority.
b. Isolation: None.
c. Concurrent disinfection: Of sputum and blood and articles freshly soiled by these substances, using 0.05% hypochlorite, 5% peroxide or a 1:100 solution of Lysol. Use precautions at postmortem examination of suspected cases in humans or animals.
d. Quarantine: None.
e. Immunization of contacts: Unnecessary.
f. Investigation of contacts and source of infection: Search for history of contact with sheep, cattle or goats on farms or in research facilities, parturient cats, consumption of raw milk, or direct or indirect association with a laboratory that handles *C. burnetii*.
g. Specific treatment: Acute disease: Tetracyclines (particularly doxycycline) administered orally and continued for 15-21 days; reinstitute if relapse occurs. Chronic disease (endocarditis): Doxycycline and oflaxacin for several years, or doxycycline in combination with hydroxychloroquine for several years. Surgical replacement of the infected valve may be necessary in some patients for cure.

3. Epidemic measures

Outbreaks are generally of short duration; control measures are limited essentially to elimination of sources of infection, observation of exposed people and antibiotic therapy for those becoming ill.

4. International measures

Control the importation of goats, sheep and cattle, and their products (e.g., wool). WHO Collaborating Centres.